APTD - 0823

PB 207 693

NEW ORLEANS METROPOLITAN AREA AIR POLLUTANT EMISSION INVENTORY

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Consumer Protection and Environmental Health Service

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56

BIBLIOGRAPHIC DATA SHEET	1. Report No. APTD-0823	2.	3. Recipient's Accession No.
4. Title and Subtitle New Orleans Metropolitan Area Air Pollutant Emission Inventory			5. Report Date October 1969 6.
7. Author(s) Alan J. Hoffman			8. Performing Organization Rept. No.
9. Performing Organization Name and Address U. S. Department of Health, Education, and Welfare National Air Pollution Control Administration Division of Air Quality and Emission Data Durham, North Carolina			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address Same			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstracts

A summary is presented of the emission inventory for the New Orleans Metropolitan Area. The report provides estimates of total emissions of oxides of sulfur, oxides of nitrogen, hydrocarbons, carbon monoxide, and particulate matter. The emissions of these pollutants are delineated with respect to source type, season of the year as well as their geographical distribution within the area. The Study Area consisted of six parishes surrounding the city of New Orleans. The Study Area is divided into grid zones that serve as the basis for locating sources and reporting their emissions. All emissions were divided into the following categories: fuel combustion in stationary sources, solid-waste disposal, industrial process losses, and evaporative losses.

17. Key Words and Document Analysis. 17a. Descriptors

Air pollution
Emission
Inventories
Sulfur oxides
Nitrogen oxides
Hydrocarbons
Carbon monoxide
Particles
Seasonal variation
Sources
Fuel
Combustion
Transportation
Waste disposal
Industrial plants
Evaporation

17b. Identifiers/Open-Ended Terms

New Orleans, Louisiana
Louisiana
Particulates
Stationary sources

17c. COSATI Field/Group 13B

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited	UNCLASSIFIED	53
	20. Security Class (This Page) UNCLASSIFIED	22. Price

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE

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National Air Pollution Control Administration

Division of Air Quality and Emission Data

Durham, North Carolina

October, 1969

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ACKNOWLEDGMENTS

We acknowledge with appreciation the many contributions of cooperating agencies in the gathering of the data for this report. In particular, we are grateful for the use of data and personnel assistance furnished by the Louisiana Air Control Commission, Louisiana State Department of Health.

PREFACE

This report which presents the emissions inventory of the New Orleans Metropolitan area is another in a series of studies outlining the sources and emissions of air pollutants for major metropolitan areas in the country. These reports provide estimates of total emissions of oxides of sulfur, oxides of nitrogen, hydrocarbons, carbon monoxide and particulate matter. The emissions of these pollutants are delineated with respect to source type, season of the year as well as their geographical distribution within the area. These surveys are also intended to determine the present level of emissions and status of their control.

The general procedure for these surveys is based on the rapid survey technique.[1] The Study Area is divided into grid zones that serve as the basis for locating sources and reporting their emissions. All sources of pollutants are divided into two subgroups--point and area sources. Sources that emit large quantities of air pollutants are considered individually and located specifically within the area. This former group which generally contains about fifty to one hundred sources typically includes large industries, power plants, and central refuse burning facilities. The remaining multitude of sources are considered collectively as area sources and their emissions are reported as totals for grid zones. This category includes motor vehicles, home heating, smaller industries, on-site refuse burning, etc. The emissions in both cases are expressed in terms of tons of pollutants for an average annual, summer, and winter day.

Emissions for the most part are estimated using various indicators of pollutant emissions and average emission factors that are related to these. This means that information and data are collected on fuel consumption, refuse burning rates, vehicle miles and gasoline consumption, as well as various production data. These are then translated into emission estimates by use of average emission factors.[2] These factors, for the most part, represent average emission rates for a particular

industry or fuel type. Because of the inherent difference in type of equipment, operating rates, control equipment, and efficiency of operation among the plants and fuel users within a given category, the application of the emission factors to any individual plant or even a smaller number of similar plants or processes may result in a discrepancy between the actual and the estimated emissions. However, the estimates of total pollutants from all sources in the study area should be reasonably accurate since the emission factors are based on average conditions.

INTRODUCTION

The information and data presented in this report were gathered in cooperation with the Louisiana Air Control Commission during a survey conducted in July, 1969. The data obtained in this study is for the most part representative of 1968, and emission estimates presented herein should be considered as showing the conditions during 1968.

For purposes of this survey a Study Area consisting of six parishes surrounding the city of New Orleans was selected. This entire area covers some 2,500 square miles and included a 1968 population of about 1.06 million people. The Study Area was subdivided into grid zones ranging in size from 25 square kilometers in the heavily populated and industrialized areas to 1,600 square kilometers in the outlying areas.

Any individual source which had emissions of any one pollutant greater than 0.5 ton per average annual day was classified as a point source and located specifically in the aforementioned grid zones. Individual sources fall into this classification and the remaining single sources were added to the area sources and reported as grid totals.

SUMMARY OF RESULTS

An estimated 777,000 tons of the five major pollutants are emitted annually in the Study Area. The breakdown of these emissions by type of pollutant and source category are summarized in Table 1. The following is a brief summary of pollutant emissions as presented in Table 1.

Sulfur Oxides — 1968 Total = 67,630 Tons

Road Vehicles	2.5%
Other Transportation	13.1%
Industrial Processes	83.4%
Solid Waste Disposal	1.0%

Particulates — 1968 Total = 66,880 Tons

Road Vehicles	4.2%
Other Transportation	10.6%
Fuel Combustion	
Industrial	2.0%
Residential	0.3%
Steam-Electric	0.6%
Solid Waste Disposal	11.3%
Industrial Process	70.7%

Carbon Monoxide — 1968 Total = 427,800 Tons

Road Vehicles	84.9%
Other Transportation	4.8%
Solid Waste Disposal	6.8%
Industrial Processes	3.6%

Hydrocarbons	1968 Total = 120,150 Tons
Road Vehicles	23.8%
Other Transportation	9.1%
Solid Waste Disposal	6.9%
Evaporative Losses	15.1%
Industrial Processes	45.0%

Nitrogen Oxides	1968 Total = 71,140 Tons
Road Vehicles	28.9%
Other Transportation	21.1%
Fuel Combustion	
Industrial	22.9%
Residential	1.9%
Utility Power Plants	15.8%
Solid Waste Disposal	5.4%
Industrial Process	3.1%

TABLE 1 SUMMARY OF AIR POLLUTANTS IN THE NEW ORLEANS STUDY AREA, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	1,690	2,840	363,000	28,600	20,600
Boats & Trains	8,800	6,600	3,400	7,600	14,000
Aircraft	N	500	16,940	3,320	1,030
Sub-Total	10,490	9,940	383,340	39,520	35,630
Fuel Combustion in Stationary Sources					
Industry	30	1,380	30	N	16,350
Steam-Electric	30	430	N	N	11,260
Residential	N	220	N	N	1,380
Commercial and Institutional	N	70	N	N	480
Sub-Total	60	2,100	30	N	29,470
Solid Waste					
Municipal Inc.	290	2,570	290	90	580
On-Site Inc.	120	630	5,770	90	270
Open Burning	270	4,340	23,070	8,150	2,990
Sub-Total	680	7,540	29,130	8,330	3,840
Industrial Processes	56,400	47,300	15,300	54,100	2,200
Evaporative Losses					
Motor Vehicles	--	--	--	18,200	--
TOTAL	67,630	66,880	427,800	120,150	71,140

N=Negligible

STUDY AREA

The Study Area for the emission survey of the New Orleans Metropolitan Area consists of six parishes--Jefferson, Orleans, St. Bernard, St. Charles, St. John the Baptist and St. Tammany. The six parish area is located in the south-eastern region of Louisiana.

Figure 1 represents a detailed drawing of the New Orleans Study Area, showing the boundaries of the city of New Orleans. The Study Area occupies 2,513 square miles and contains an estimated 1968 population of 1,063,000, which is approximately a 14 percent increase since 1960 (Table 2)[3]. The population density map (Figure 2) shows that the heaviest population is concentrated in and near the city of New Orleans.

TABLE 2 AREA AND POPULATION CHARACTERISTICS FOR THE NEW ORLEANS STUDY AREA, 1968

Parish	Population 1968	Population 1960	Land Area (Sq. Miles)	Population Density 1968
Jefferson	248,260	208,770	331	750
Orleans	686,670	627,530	205	3,350
St. Bernard	37,520	32,190	514	73
St. Charles	25,230	21,220	288	88
St. John the Baptist	21,540	18,440	250	86
St. Tammany	44,210	38,640	925	48
TOTAL	1,063,430	946,790	2,513	423

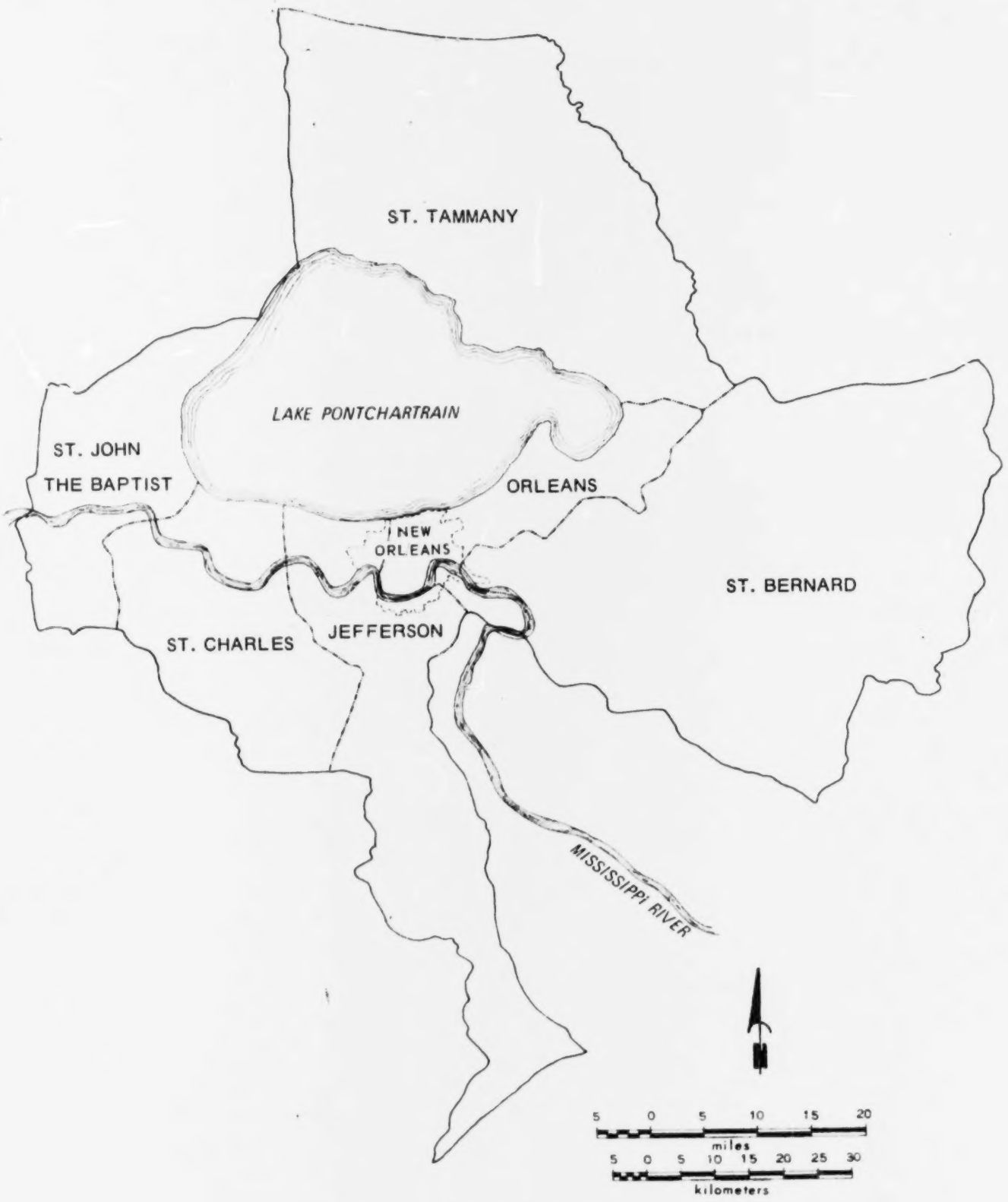

Figure 1. New Orleans study area.

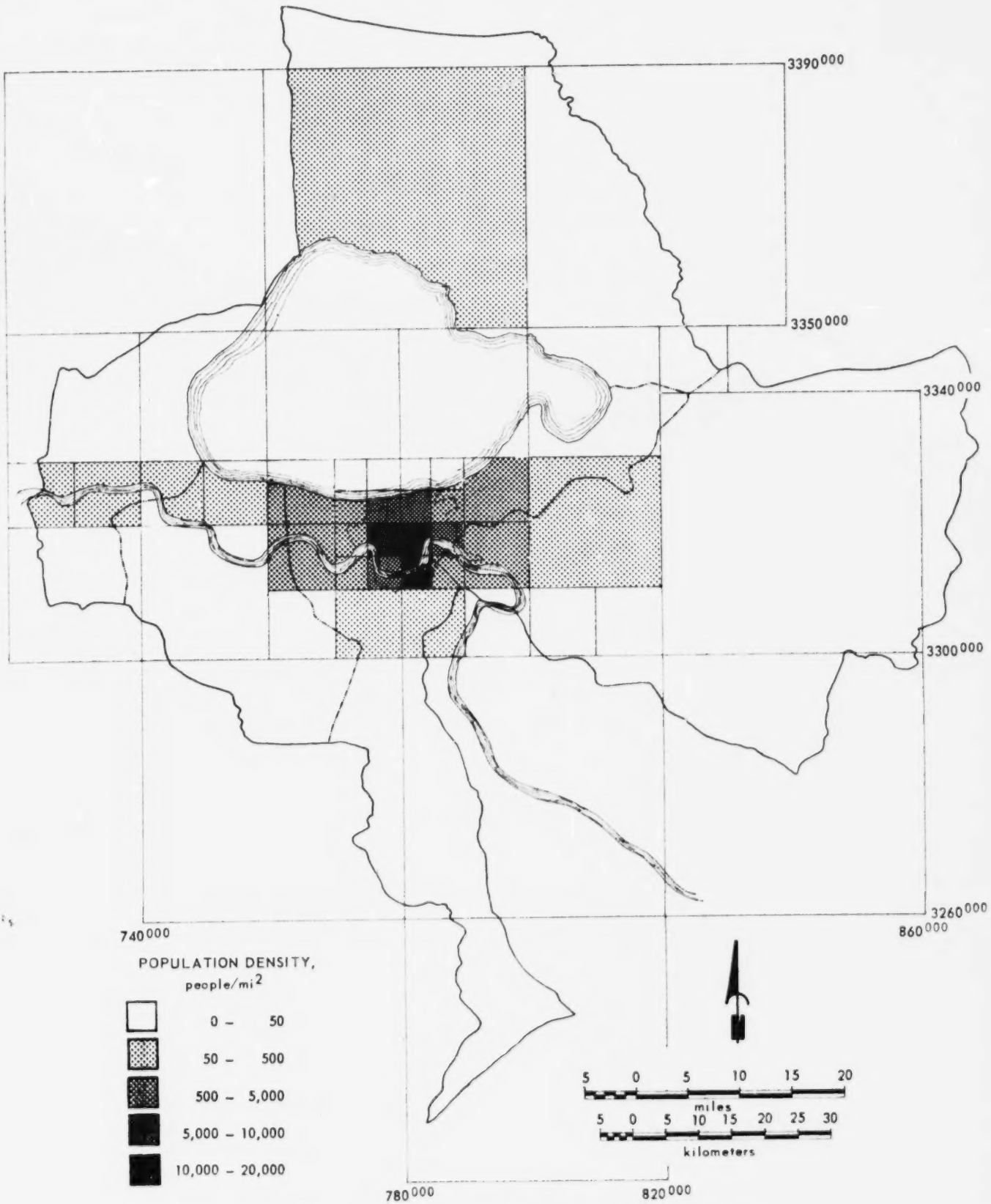

Figure 2. Population density for the New Orleans study area.

TOPOGRAPHY

The New Orleans Study Area is located in the south-eastern portion of Louisiana. The terrain in this part of the state is primarily marshy delta land with numerous bayous, canals and drainage ditches.

The elevations in the New Orleans area vary from a few feet above sea level to a few feet below.

Lake Borgne is next to the eastern part of the Study Area, and Lake Pontchartrain which connects with the Gulf of Mexico is to the north.

GRID COORDINATE SYSTEM

Grid coordinates based on the Universal Transverse Mecator System were used in this study to show the geographical distribution of sources and emissions. As shown in Figure 3, the Study Area was divided into 47 grids of four different sizes--25,100, 400 and 1,600 square kilometers.

Different size grids are used to limit the number of grid zones and yet allow a satisfactory definition of geographical gradation of emissions in areas where the majority of pollution occurs. For this reason, the 25 square kilometer grids are used in the downtown areas and areas of high industrial concentration where the emission densities would change abruptly within short distances. In areas primarily rural in nature, the use of small zones is not as important.

As illustrated in Figure 3 each grid line is identified by a coordinate number. The north-south and the east-west coordinates are expressed in meters.

The point sources in the Study Area are identified by both horizontal and vertical coordinates to the nearest 100 meters. The grids are identified by the coordinates of their geographical center.

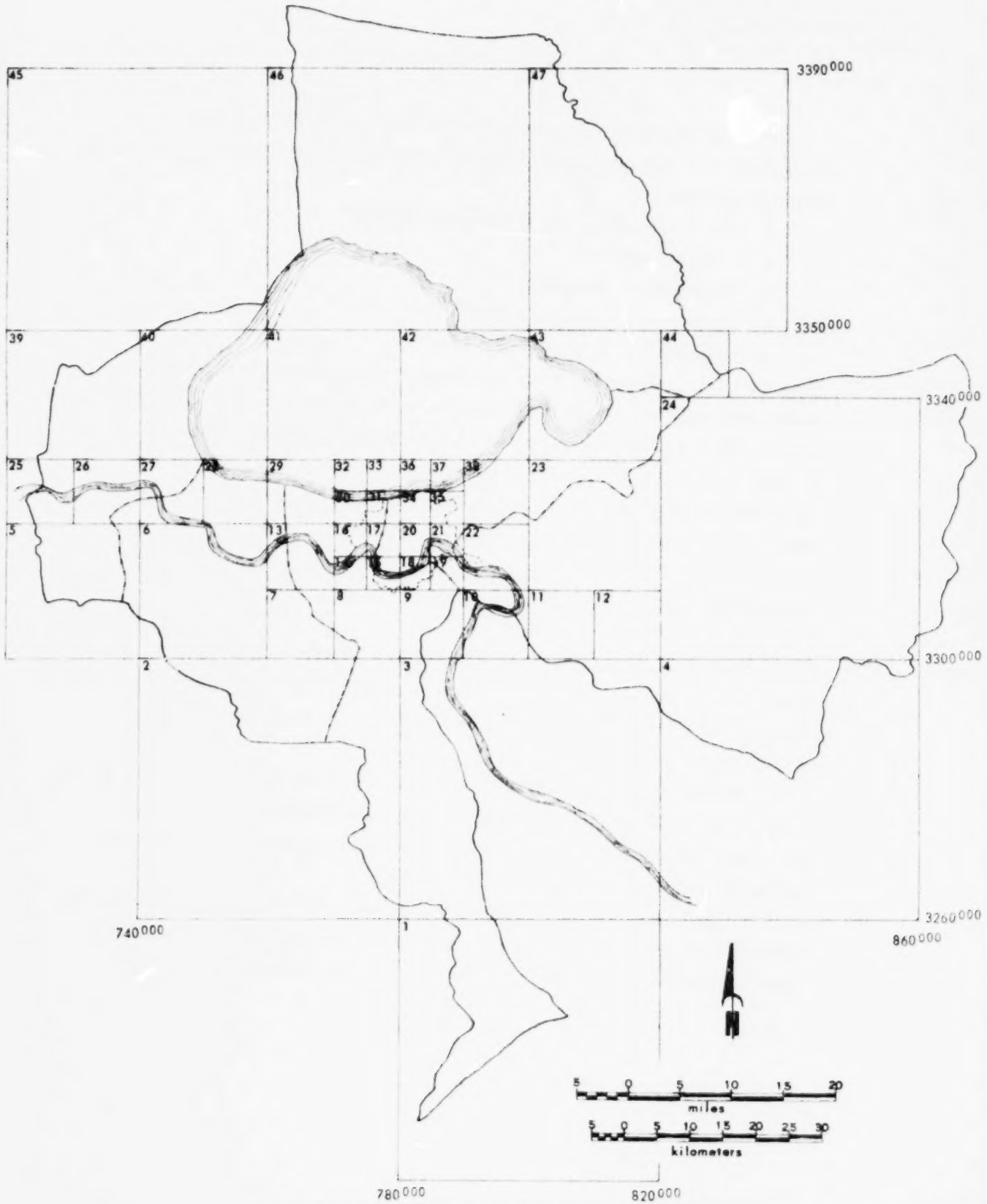

Figure 3. New Orleans study area and coordinate system.

EMISSIONS BY CATEGORY

For the purposes of compiling the basic data and emission estimates, the air pollutant sources were classified into the following five categories:

1. Fuel combustion in stationary sources
2. Transportation
3. Solid Waste disposal
4. Industrial process losses
5. Evaporative losses

Each of these categories are considered individually in this section where data sources are given and methods of calculation are discussed.

It is important to note that the estimates presented herein are, in most cases, partial totals. This stems from the inavailability of emission factors as well as appropriate production data. The results should be viewed with these limitations in mind.

Fuel Combustion in Stationary Sources

Table 3 presents the fuel consumption within the Study Area. As shown in the table, natural gas is the primary fuel used in the area. During 1968, over 243 billion cubic feet of natural gas were consumed within the Study Area.

Industrial plants are the largest fuel users in the area, consuming almost 63 percent of the natural gas. Steam-electric utilities consume approximately 24 percent of the total natural gas, residential units 10 percent and commercial establishments 3 percent.

Natural gas, for all practical purposes, is the only fuel used for residential home heating. There are homes heated by other fuels but they represent a very small percentage of the total.

TABLE 3 NATURAL GAS CONSUMPTION FOR THE NEW ORLEANS STUDY AREA, 1968

(MILLION CUBIC FEET/YEAR)

Parish	Industrial	Steam-Electric Utility	Residential	C & I	TOTAL
Jefferson	16,800	16,000	6,600	1,860	41,260
Orleans	20,400	43,000	14,300	5,500	83,200
St. Bernard	64,200	--	1,000	120	65,320
St. Charles	31,700	--	600	150	32,450
St. John the Baptist	13,000	--	580	130	13,710
St. Tammany	2,000	--	780	270	3,050
TOTAL	148,100	59,000	23,860	8,030	238,990

C & I= Commercial and Institutional

Emissions from Fuel Combustion

Air pollutant emissions resulting from fuel combustion in stationary sources are summarized in Table 4. The emissions are presented for industrial, steam-electric utility, residential and commercial--institutional sources. Emissions from natural gas consumption account for approximately 42 percent of the total nitrogen oxide emissions and less than 3 percent of the total for any other pollutant.

Data Sources

Natural gas numbers were supplied by the local gas companies who gave these numbers by jurisdiction with a breakdown by industry, residential, commercial and institutional source categories. The large industrial users in the Study Area, as well as all steam-electric plants were considered individually as single sources. The balance of the fuel was distributed to the three area source categories of fuel consumption: (1) residential (2) commercial--institutional and (3) industrial.

The amount of fuel burned for home heating purposes was calculated using the procedure described in the Rapid Survey Technique.[4] This method involves the use of such variables, as total annual degree days, average number of rooms per dwelling unit, and the number of units using each type of fuel.

TABLE 4 AIR POLLUTANT EMISSIONS FROM FUEL COMBUSTION IN THE NEW ORLEANS STUDY AREA, 1968

(TONS/YEAR)

User Category	Sulfur Oxides	Partic-ulates	Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Industrial	30	1,380	30	N	16,350
Steam-Electric Utilities	30	430	N	N	11,260
Residential	N	220	N	N	1,380
Commercial and Institutional	N	70	N	N	480
TOTAL	60	2,100	30	N	29,470

N=Negligible

Transportation

Four types of transportation sources of air pollution are considered in this survey--road vehicles, aircraft, railroads, and vessels. Road vehicles, which are by far the most significant source of air pollution in this category, are further subdivided according to type of fuel--gasoline or diesel.

Road Vehicles

The miles of travel by motor vehicles in the Study Area are summarized in Table 5. Vehicle mile data for all major arterials and highways in Orleans and Jefferson parishes were obtained from a transportation study performed by New Orleans Metropolitan Area Transportation Study for 1960. Estimates were made in order to include the traffic on secondary and rural roads and to update the data to 1968. The vehicle miles were apportioned onto grids by traffic flow maps provided by the Transportation Study.

In the other four parishes, vehicle mile information was not available and thus gasoline consumption[5] was used to find vehicular emissions. The gasoline consumed in each county was apportioned on a grid basis by population.

Emissions from diesel powered vehicles were determined by diesel fuel consumption in each county.[6] These emissions were apportioned on a grid basis by assuming they were proportional to gasoline emissions.

Emissions from road vehicles are a function of the speed at which the vehicle travels. Average speeds of 10-20 mph were assumed for downtown areas; 20-30 mph for the residential areas; and 30-45 mph for the rural areas.

From all transportation sources, road vehicles accounted for 16 percent of the sulfur oxides, 28 percent of the particulates, 95 percent of the carbon monoxide, 72 percent of the hydrocarbons and 58 percent of the nitrogen oxides. Gasoline powered road vehicles contributed a greater percent of all pollutants than diesel powered road vehicles. Emissions from transportation sources are summarized in Table 6.

TABLE 5 VEHICLE MILES OF TRAVEL FOR ROAD VEHICLES IN THE NEW ORLEANS STUDY AREA, 1968

Jurisdiction	Thousands of Vehicle Miles Per Day	
	Gasoline	Diesel
Jefferson	4,300	100
Orleans	5,600	130
St. Bernard	490	10
St. Charles	340	8
St. John the Baptist	263	7
St. Tammany	875	20
TOTAL	11,868	275

TABLE 6 AIR POLLUTANT EMISSIONS FROM TRANSPORTATION SOURCES IN THE NEW ORLEANS STUDY AREA 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbon	Nitrogen Oxides
Motor Vehicles					
Gasoline	1,300	1,730	362,100	27,300	18,400
Evaporation	--	--	--	18,200	--
Diesel	390	1,110	900	1,300	2,200
Sub-Total	1,690	2,840	363,000	46,800	20,600
Aircraft	N	500	16,940	3,320	1,030
Railroads	100	300	200	400	800
Vessels	8,700	6,300	3,200	7,200	13,200
TOTAL	10,490	9,940	383,340	57,720	35,630

Aircraft

Table 7 shows the air traffic activity at the two large airports in the Study Area, with a breakdown by engine type. From all transportation sources aircraft accounted for 5 percent of the particulates, 5 percent of the carbon monoxide, 8 percent of the hydrocarbons and 3 percent of the nitrogen oxides.

Railroads

Railroads consume about 6 million gallons of diesel fuel per year in the Study Area. These figures were obtained from the various railroads in the Study Area. The air pollutant emissions arising from railroad sources are insignificant when compared to other transportation sources.

Vessels

The Port of New Orleans supplied data on the vessel traffic on the Mississippi River. This included a breakdown by vessel type. Using various assumptions of the amount of fuel burned while in port and on average fuel consumption per mile of travel, estimates of fuels consumed by vessels were obtained. It was estimated that 42 million gallons of residual and 105 million gallons of diesel fuels were consumed by vessels in 1968. Table 8 shows the emissions resulting from this fuel consumption.

Solid Waste Disposal

Approximately 1.8 million tons of refuse was generated during 1968 in the Study Area. Table 9 presents a solid waste balance for the New Orleans Study Area, showing the various methods of disposal and the quantities disposed of by each method. A per capita generation rate of 10 lb./day was assumed for the Area. Sanitary landfills accounted for 17 percent of the total refuse disposed, open burning dumps 28 percent, on-site open burning 23 percent, and municipal incinerators 32 percent.

Refuse data for all parishes was supplied by the Louisiana State Department of Health. Table 10 shows the air pollutant emissions from solid waste disposal in the New Orleans Study Area. A total of 29,130 tons of carbon monoxide, 7,540 tons of particulates, 8,330 tons of

TABLE 7 AIRCRAFT ACTIVITY FOR THE NEW ORLEANS STUDY AREA, 1968 (FLIGHTS/YEAR)

Engine Type	Moisant Field	Lakefront
1 Engine Piston	19,300	100,400
2 Engine Piston	6,500	33,450
2 Engine Jet	17,700	760
3 Engine Jet	19,200	800
4 Engine Jet	17,400	720
TOTAL	80,100	136,130

TABLE 8 AIR POLLUTANT EMISSIONS FROM VESSELS IN THE STUDY AREA, 1968 (TONS/YEAR)

Parish	Sulfur Oxide	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Orleans	3,020	2,190	1,110	2,500	4,580
Jefferson	2,270	1,640	840	1,880	3,440
St. Bernard	570	410	210	470	860
St. Charles	1,550	1,120	570	1,280	2,350
St. John the Baptist	1,290	940	470	1,070	1,970
St. Tammany	N	N	N	N	N
TOTAL	8,700	6,300	3,200	7,200	13,200

N = Negligible

TABLE 9 SOLID WASTE DISPOSAL BY JURISDICTION FOR THE STUDY AREA, 1968 (TONS/YEAR)

Parish	Refuse Generated	Sanitary Landfills	Incineration		Open Burning	
			Municipal	On-Site	Dumps	On-Site
Jefferson	453,000	--	170,000	90,000	103,000	90,000
Orleans	1,250,000	300,000	400,000	85,000	385,000	80,000
St. Bernard	38,000	--	14,000	4,000	18,000	2,000
St. Charles	25,000	--	--	10,300	6,000	9,000
St. John the Baptist	21,600	--	--	10,000	2,600	9,000
St. Tammany	44,400	10,000	--	14,400	8,000	12,000
TOTAL	1,832,300	310,000	584,000	213,700	522,600	202,000

TABLE 10 AIR POLLUTANT EMISSIONS FROM SOLID WASTE DISPOSAL IN THE NEW ORLEANS STUDY AREA 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Municipal Incineration	290	2,570	290	90	580
On-Site Incineration	120	630	5,770	90	270
Open Burning	270	4,340	23,070	8,150	2,990
TOTAL	680	7,540	29,130	8,330	3,840

hydrocarbons and 3,840 tons of nitrogen oxides were emitted from solid waste disposal practices. The largest sources were three municipal incinerators in New Orleans and two others in Jefferson Parish. There were also large open burning dumps in Orleans and Jefferson parishes.

Industrial Process Losses

Emissions from selected industrial process losses in the Study Area are shown in Table 11. The chemical process industry is the major source of emissions in the Study Area accounting for 27% of the SOx and 80% of the carbon monoxide. Typical processes in this grouping include sulfuric acid manufacture and various industrial chemicals. Oil refineries is the next largest source for sulfur oxides and carbon monoxide while grain elevators are the largest particulate matter emitters.

Evaporative Losses

Emissions in this category were mainly losses from filling and handling of gasoline at service stations. These operations accounted for over 18,000 tons of hydrocarbons in 1968.

TABLE 11 AIR POLLUTANT EMISSIONS FROM SELECTED INDUSTRIAL PROCESSES IN THE NEW ORLEANS STUDY AREA 1968 (TONS/YEAR)

Type of Industry	Sulfur Oxides	Partic-ulates	Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Oil Refining	31,900	3,200	4,300	11,000	2,200
Grain Elevators	--	26,800	--	--	--
Chemical Process Industry	20,500	1,800	11,000	43,100	--
Asphalt Plants	--	1,050	--	--	--
Metals	4,000	10,200	--	--	--
Cement	--	150	--	--	--
Sugar	--	1,900	--	--	--
Other	--	2,100	--	--	--
TOTAL	56,400	47,200	15,300	54,100	2,200

EMISSIONS BY JURISDICTION

In order to determine which counties are significant from an air pollution standpoint, emissions have been summarized for each of the six parishes. Table 12 through Table 17 present the summary of emissions for each parish.

The air pollutant emissions are far greater in Orleans and Jefferson parishes than in any of the other four parishes. This is due to the high population density and heavier industrialization in these areas. Of the total Study Area emissions Jefferson and Orleans account for:

32% of the SOx
44% of the Particulates
84% of the CO
67% of the HC
67% of the NOx

St. Bernard and St. Charles parishes have high emission rates in the industrial process category due to a few large sources rather than a multitude of smaller ones.

TABLE 12 JEFFERSON PARISH SUMMARY OF AIR POLLUTANT EMISSIONS, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	610	1,030	131,400	10,340	7,450
Other	2,320	2,210	4,150	2,870	4,290
Sub-Total	2,930	3,240	135,450	13,210	11,740
Fuel Combustion in Stationary Sources					
Industrial	N	150	N	N	1,800
Steam-Electric	N	120	N	N	3,120
Residential	N	60	N	N	380
Commercial and Institutional	N	20	N	N	110
Sub-Total	N	350	N	N	5,410
Solid Waste					
Municipal Inc.	80	360	80	30	170
On-Site Inc.	50	270	2,420	40	110
Open Burning	70	1,160	6,140	2,170	800
Sub-Total	200	1,790	8,640	2,240	1,080
Industrial Process	11,000	6,770	11,100	25,000	--
Evaporative Losses					
Motor Vehicles	--	--	--	6,600	--
Other	--	--	--	--	--
TOTAL	14,130	12,150	155,190	47,050	18,230

N=Negligible

TABLE 13 ORLEANS PARISH SUMMARY OF AIR POLLUTANT EMISSIONS, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	800	1,340	171,300	13,500	9,720
Other	3,070	2,420	14,940	5,230	5,560
Sub-Total	3,870	3,760	186,240	18,730	15,280
Fuel Combustion in Stationary Sources					
Industrial	10	240	10	N	2,830
Steam-Electric	20	310	N	N	8,140
Residential	N	140	N	N	830
Commercial and Institutional	N	50	N	N	320
Sub-Total	30	740	10	N	12,120
Solid Waste					
Municipal Inc.	200	2,180	200	60	400
On-Site Inc.	40	250	2,300	30	110
Open Burning	180	2,780	14,800	5,230	1,920
Sub-Total	420	5,210	17,300	5,320	2,430
Industrial Process	--	7,230	--	--	--
Evaporative Losses					
Motor Vehicles	--	--	--	8,580	--
Other	--	--	--	--	--
TOTAL	4,320	16,940	203,550	32,630	29,830

N=Negligible

TABLE 14 ST. BERNARD PARISH SUMMARY OF AIR POLLUTANT EMISSIONS, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	70	120	15,100	1,190	860
Other	570	410	210	470	860
Sub-Total	640	530	15,310	1,660	1,720
Fuel Combustion in Stationary Sources					
Industrial	10	580	10	N	6,870
Steam-Electric	--	--	--	--	--
Residential	N	10	N	N	60
Commercial and Institutional	N	N	N	N	10
Sub-Total	10	590	10	N	6,940
Solid Waste					
Municipal Inc.	10	30	10	N	10
On-Site Inc.	N	10	110	N	10
Open Burning	10	120	640	220	80
Sub-Total	20	160	760	220	100
Industrial Process	16,600	11,800	1,700	4,000	800
Evaporative Losses					
Motor Vehicles	--	--	--	760	--
Other	--	--	--	--	--
TOTAL	17,270	13,080	17,780	6,640	9,560

N=Negligible

TABLE 15 ST. CHARLES PARISH SUMMARY OF AIR POLLUTANT EMISSIONS, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	50	80	10,380	820	590
Other	1,550	1,120	570	1,280	2,350
Sub-Total	1,600	1,200	10,950	2,100	2,940
Fuel Combustion in Stationary Sources					
Industrial	10	290	10	N	3,400
Steam-Electric	--	--	--	--	--
Residential	N	N	N	N	30
Commercial and Institutional	N	N	N	N	10
Sub-Total	10	290	10	N	3,440
Solid Waste					
Municipal Inc.	--	--	--	--	--
On-Site Inc.	10	30	280	10	10
Open Burning	N	90	480	170	60
Sub-Total	10	120	760	180	70
Industrial Process	28,700	15,930	2,500	24,900	1,380
Evaporative Losses					
Motor Vehicles	--	--	--	520	--
Other	--	--	--	--	--
TOTAL	30,320	17,540	14,220	27,700	7,830

N=Negligible

TABLE 16 ST. JOHN THE BAPTIST PARISH SUMMARY OF AIR POLLUTANT EMISSIONS, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	40	60	8,100	640	460
Other	1,290	940	470	1,070	1,970
Sub-Total	1,330	1,000	8,570	1,710	2,430
Fuel Combustion in Stationary Sources					
Industrial	N	120	N	N	1,400
Steam-Electric	--	--	--	--	--
Residential	N	N	N	N	30
Commercial and Institutional	N	N	N	N	10
Sub-Total	N	120	N	N	1,440
Solid Waste					
Municipal Inc.	--	--	--	--	--
On-Site Inc.	10	30	270	N	10
Open Burning	N	70	370	130	50
Sub-Total	10	100	640	130	60
Industrial Process	100	4,570	--	200	--
Evaporative Losses					
Motor Vehicles	--	--	--	400	--
Other	--	--	--	--	--
TOTAL	1,440	5,790	9,210	2,440	3,930

N=Negligible

TABLE 17 ST. TAMMANY PARISH SUMMARY OF AIR POLLUTANT EMISSIONS, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	120	210	26,720	2,110	1,520
Other	N	N	N	N	N
Sub-Total	120	210	26,720	2,110	1,520
Fuel Combustion in Stationary Sources					
Industrial	N	N	N	N	50
Steam-Electric	--	--	--	--	--
Residential	N	10	N	N	50
Commercial and Institutional	N	N	N	N	20
Sub-Total	N	10	N	N	120
Solid Waste					
Municipal Inc.	--	--	--	--	--
On-Site Inc.	10	40	390	10	20
Open Burning	10	120	640	230	80
Sub-Total	20	160	1,030	240	100
Industrial Process	--	1,000	--	--	--
Evaporative Losses					
Motor Vehicles	--	--	--	1,340	--
Other	--	--	--	--	--
TOTAL	140	1,380	27,750	3,690	1,740

N=Negligible

EMISSIONS BY GRID

Emissions from large fuel users, process sources, open burning dumps, airports, etc., are presented in Table 18 and located in Figure 4. These are totaled by grid and added to area sources to arrive at the figures presented in Table 19. Area sources include residential home heating, small commercial and industrial fuel users, mobile sources such as cars, trucks, trains, vessels etc. and open burning.

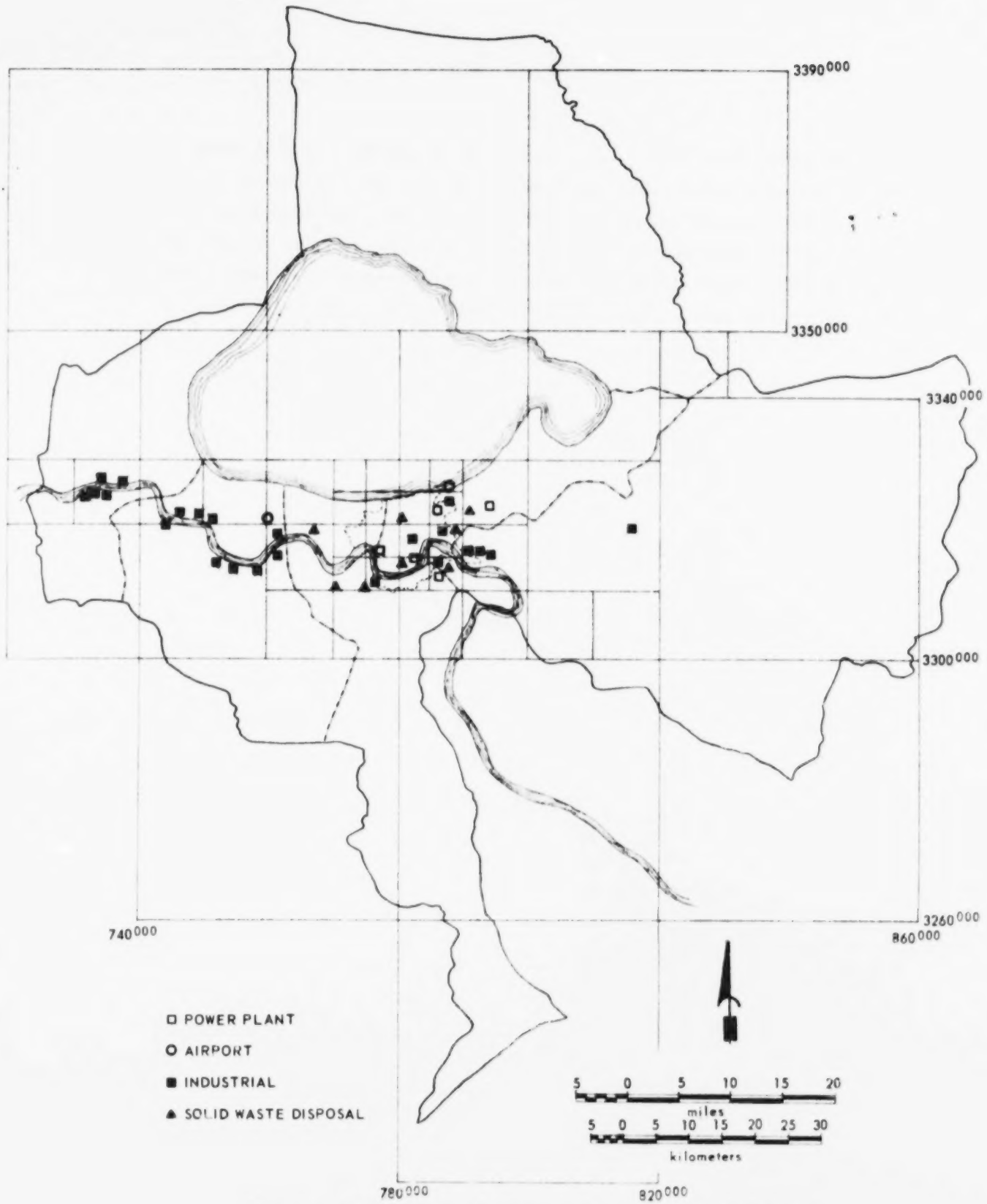

Figure 4. Location of point sources in the New Orleans study area.

TABLE 18 SUMMARY OF POINT SOURCE EMISSIONS FOR THE NEW ORLEANS STUDY AREA, 1968 (TONS/DAY)

Source Category	Grid	HC	VC	SOx	PART.	CO	HC	NOx
Industrial	6	7552	33151	--	13.82	--	--	--
Industrial	6	7560	33150	--	19.75	--	--	--
Industrial	6	7598	33149	--	2.12	--	--	--
Industrial	12	8190	33190	--	0.04	--	--	0.54
Municipal Inc.	13	7687	33195	0.19	1.14	0.19	0.06	0.34
Industrial	13	7630	33174	30.14	0.40	30.15	43.83	--
Industrial	13	7623	33190	--	0.25	0.35	0.16	0.07
Open Dump	14	7728	33120	0.09	1.50	5.74	1.06	0.18
Open Dump	15	7750	33105	0.01	0.17	0.65	0.12	0.02
Industrial	15	7773	33114	--	0.82	--	24.65	--
Steam-Electric	15	7755	33163	--	0.33	--	--	8.55
Industrial	15	7780	33125	--	13.52	--	--	--
Industrial	17	7753	33152	--	16.70	--	--	--
Municipal Inc.	18	7813	33140	0.14	2.33	0.14	0.04	0.27
Open Dump	19	7856	33143	0.10	1.75	6.68	1.23	0.21
Municipal Inc.	19	7856	33143	0.05	0.33	0.05	0.02	0.11
Industrial	19	7860	33250	--	2.47	--	--	--
Steam-Electric	19	7834	33150	--	0.09	--	--	2.51
Industrial	20	7827	33127	--	0.30	0.01	--	0.50
Industrial	21	7827	33172	--	0.85	--	--	2.66
Industrial	21	7867	33197	--	0.05	--	--	0.62
Open Dump	21	7892	33198	0.29	4.98	19.00	3.51	0.59

SUMMARY OF POINT SOURCE EMISSIONS (cont.)

Source Category	Grid	HC	VC	SOx	PART.	CO	HC	NOx
Industrial	21	7890	33170	--	3.86	--	--	--
Industrial	21	7893	33166	--	0.08	--	--	0.92
Open Dump	22	7940	33197	0.02	0.31	1.20	0.22	0.04
Industrial	22	7915	33155	10.98	28.65	0.03	--	15.00
Industrial	22	7955	33155	4.50	0.19	0.62	1.92	0.73
Industrial	22	7920	33154	30.00	1.06	4.00	8.94	3.83
Industrial	25	7232	33258	0.01	0.26	0.01	0.01	3.75
Industrial	26	7360	33260	--	2.03	--	--	--
Industrial	26	7317	33267	--	1.99	--	--	--
Industrial	26	7389	33267	0.27	--	--	0.55	--
Industrial	26	7336	33274	--	1.18	--	--	--
Industrial	26	7330	33272	--	7.31	--	--	--
Industrial	27	7462	33205	3.29	--	--	28.50	--
Industrial	27	7500	33220	52.60	7.67	6.85	19.20	3.78
Industrial	27	7462	33205	22.50	0.28	--	--	--
Industrial	28	7500	33220	0.13	0.14	--	20.55	1.61
Airport	29	7640	33210	--	1.15	8.80	2.17	1.24
Municipal Inc.	34	7845	33208	0.11	1.86	0.11	0.03	0.22
Industrial	35	7869	33233	--	0.90	--	--	--
Industrial	37	7864	33252	--	1.27	--	--	--
Airport	37	7875	33270	--	0.22	37.61	6.93	1.58
Steam-Electric	38	7953	33235	0.02	0.60	--	--	15.52
Steam-Electric	38	7869	33233	0.06	0.16	--	--	4.27
Municipal Inc.	38	7928	33240	0.25	1.47	0.25	0.07	0.49
Industrial	47	8040	33950	--	2.74	--	--	--

TABLE 19 SUMMARY OF TOTAL AIR POLLUTANT EMISSIONS BY GRID AND SEASON FOR THE NEW ORLEANS STUDY AREA

1968 (TONS/DAY)

Grid	Area (mi^2)	SOx			PART.			CO			HC			NOx		
		S	W	A	S	W	A	S	W	A	S	W	A	S	W	A
1	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	200	0.01	0.01	0.01	0.01	0.01	0.01	2.25	2.20	2.23	0.29	0.28	0.28	0.12	0.13	0.13
3	150	--	--	--	--	--	--	0.83	0.82	0.83	0.10	0.10	0.10	0.04	0.05	0.04
4	180	--	--	--	0.04	0.04	0.04	0.13	0.13	0.13	--	--	--	--	--	--
5	80	--	--	--	0.03	0.03	0.03	0.18	0.18	0.18	0.06	0.06	0.06	0.02	0.02	0.02
6	154	2.20	2.20	2.20	37.42	37.43	37.42	9.64	9.47	9.56	2.96	2.93	2.95	3.78	3.80	3.79
7	38.6	--	--	--	0.08	0.08	0.08	2.32	2.28	2.20	0.32	0.31	0.31	0.13	0.14	0.13
8	38.6	0.12	0.11	0.12	0.20	0.20	0.20	26.01	25.50	25.76	3.36	3.29	3.32	1.48	1.49	1.50
9	38.6	0.12	0.11	0.12	0.20	0.20	0.20	26.09	25.58	25.83	3.37	3.30	3.33	1.48	1.48	1.49
10	38.6	4.13	4.13	4.13	3.04	3.04	3.04	4.73	4.73	4.73	3.83	3.82	3.82	6.44	6.45	6.44
11	38.6	--	--	--	0.04	0.04	0.04	0.84	0.83	0.84	0.11	0.11	0.11	0.11	0.11	0.11
12	38.6	--	--	--	0.09	0.09	0.09	1.55	1.53	1.54	0.20	0.20	0.20	0.70	0.70	0.70
13	38.6	33.77	33.76	33.77	5.39	5.40	5.40	147.20	144.97	146.09	63.55	63.26	63.40	11.52	11.54	11.58
14	9.65	0.31	0.31	0.31	2.47	2.47	2.47	39.23	38.62	38.92	5.76	5.68	5.72	3.75	3.74	3.76
15	9.65	1.81	1.80	1.80	17.57	17.62	17.60	40.37	39.65	40.01	33.48	33.38	33.43	15.82	16.09	15.99
16	9.65	1.75	1.75	1.75	1.97	1.99	1.99	38.56	37.86	38.21	6.35	6.26	6.31	4.77	4.92	4.90
17	9.65	0.37	0.36	0.36	18.17	18.24	18.21	74.98	73.54	74.26	9.84	9.65	9.75	5.77	6.19	6.00
18	9.65	0.45	0.45	0.45	2.95	3.02	2.99	56.79	55.67	56.23	7.56	7.42	7.49	5.13	5.57	5.40
19	9.65	0.25	0.24	0.24	4.81	4.82	4.82	28.19	27.76	27.97	4.02	3.96	3.99	4.20	4.36	4.24
20	9.65	2.52	2.51	2.52	3.10	3.22	3.26	115.92	113.69	114.80	16.46	16.19	16.32	10.59	11.34	10.95
21	9.65	2.03	2.03	2.03	11.79	11.85	11.82	57.68	56.97	57.32	9.87	9.77	9.82	10.72	11.07	10.89
22	38.6	48.79	48.78	48.78	32.80	32.81	32.81	47.96	47.56	47.15	19.94	19.83	19.88	28.71	28.79	28.76

TABLE 19 SUMMARY OF TOTAL AIR POLLUTANT EMISSIONS (cont.)

Grid	(mi^2)	SOx			PART.			CO			HC			NOx		
		S	W	A	S	W	A	S	W	A	S	W	A	S	W	A
23	154	0.15	0.14	0.15	0.33	0.33	0.33	28.33	27.77	28.05	3.66	3.59	3.62	1.72	1.73	1.72
24	617	--	--	--	--	--	--	0.46	0.45	0.46	0.06	0.05	0.05	0.02	0.02	0.02
25	20	1.03	1.03	1.03	1.08	1.08	1.08	2.68	2.64	2.66	1.18	1.18	1.18	5.43	5.45	5.43
26	38.6	1.87	1.87	1.87	13.82	13.82	13.82	12.74	12.51	12.63	3.13	3.40	3.42	3.04	3.08	3.07
27	38.6	80.60	80.60	80.60	9.66	9.66	9.66	17.07	16.89	16.98	51.73	51.71	51.72	7.61	7.64	7.63
28	38.6	0.17	0.17	0.17	0.28	0.28	0.28	9.56	9.38	9.47	22.80	22.78	22.79	2.16	2.18	2.17
29	38.6	0.11	0.11	0.11	2.07	2.09	2.08	26.94	26.64	26.79	4.72	4.68	4.70	2.36	2.48	2.46
30	9.65	0.13	0.13	0.13	0.72	0.73	0.73	22.23	21.83	22.03	3.03	2.98	3.01	1.50	1.53	1.53
31	9.65	0.23	0.23	0.23	0.97	1.00	0.99	35.46	34.81	35.14	4.94	4.86	4.90	2.65	2.85	2.79
32	9.65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
33	9.65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
34	9.65	0.34	0.34	0.34	2.85	2.91	2.88	35.57	34.62	35.25	4.97	4.89	4.93	3.08	3.43	3.25
35	9.65	0.13	0.13	0.13	1.94	1.96	1.95	21.58	21.20	21.39	3.15	3.10	3.12	6.06	6.19	6.12
36	9.65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
37	9.65	--	--	--	1.50	1.50	1.50	39.39	39.36	39.37	7.16	7.15	7.15	1.68	1.68	1.68
38	38.6	0.82	0.81	0.81	3.38	3.38	3.38	90.69	88.90	89.80	12.74	12.49	12.61	24.28	24.30	24.28
39	80	--	--	--	0.07	0.07	0.07	1.00	0.98	0.99	0.15	0.15	0.15	0.05	0.05	0.05
40	154	--	--	--	0.08	0.08	0.08	1.61	1.62	1.61	0.23	0.23	0.23	0.09	0.10	0.09
41	154	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
42	154	0.06	0.06	0.06	0.10	0.10	0.10	13.80	13.53	13.67	1.78	1.74	1.76	0.78	0.79	0.79
43	154	0.06	0.06	0.06	0.10	0.10	0.10	13.80	13.53	13.67	1.78	1.74	1.76	0.78	0.79	0.74
44	30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
45	30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
46	617	0.31	0.31	0.31	0.86	0.88	0.87	62.36	61.15	61.76	8.16	8.01	8.08	3.61	3.71	3.65
47	300	0.08	0.06	0.06	3.09	3.09	3.09	14.23	13.97	14.13	1.86	1.83	1.85	0.83	0.85	0.84

EMISSION DENSITIES BY GRID

Emission densities on a grid basis were obtained by summing the annual area and point source emissions for each grid. This total, divided by the grid area, gives an emission density in tons per square mile per average day. Figures 5 through 9 present the emission density maps for the five surveyed pollutants. It is difficult to arrive at any valid conclusions from the emission density maps alone. For this reason, when they are analyzed, the detailed map of the Study Area, the point source location map and the population density map should also be considered.

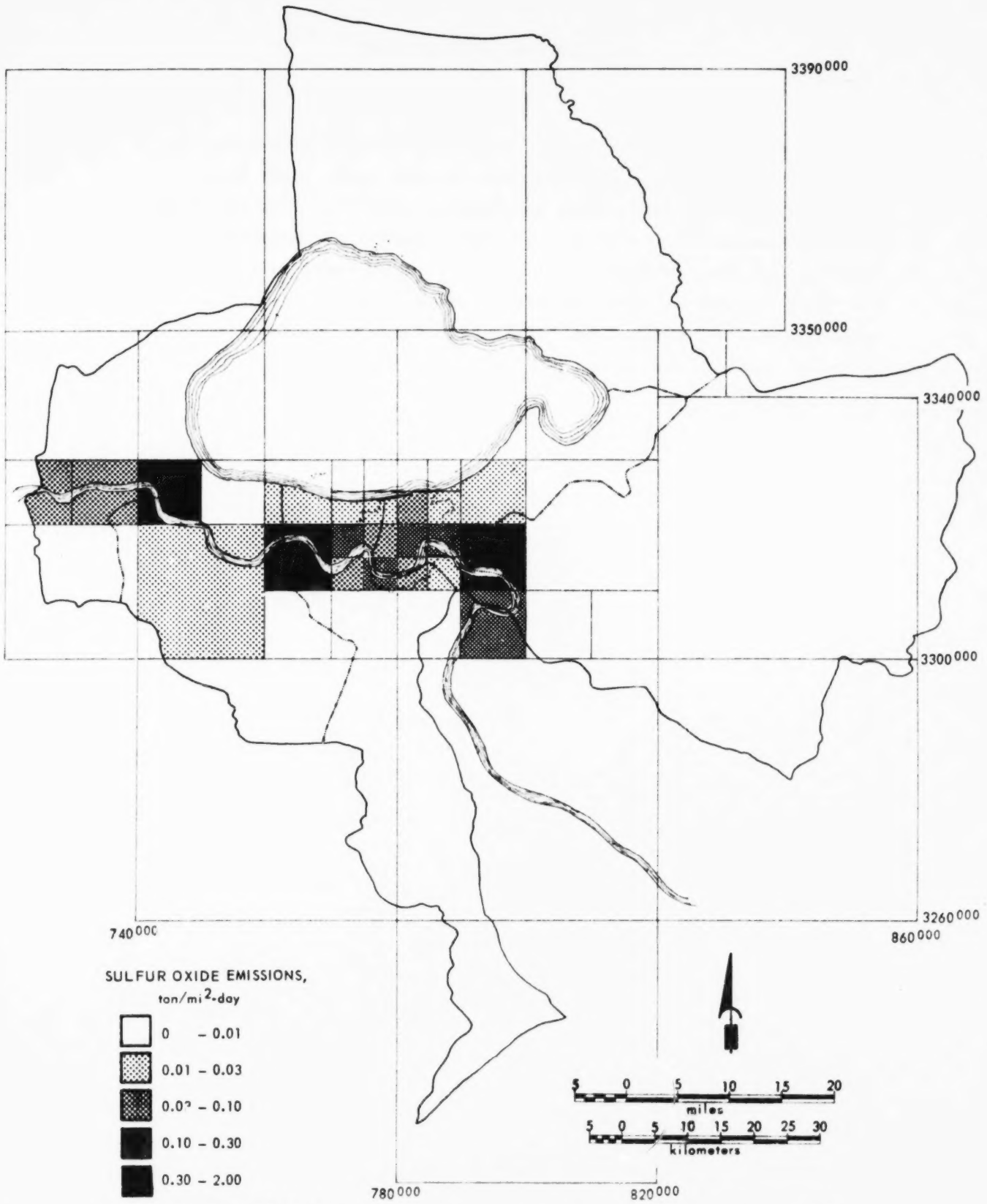

Figure 5. Sulfur oxide emission density for the New Orleans study area, 1968.

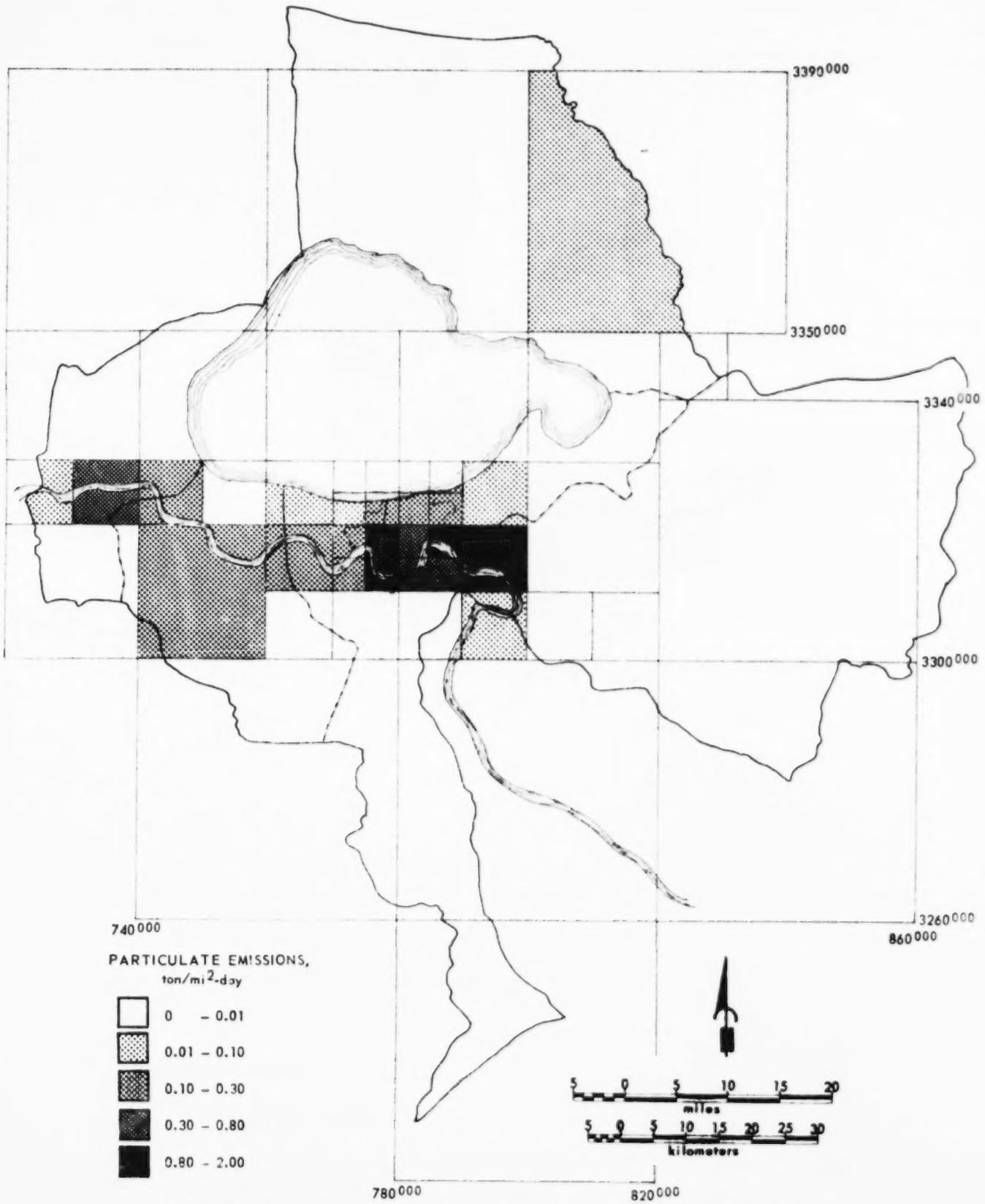

Figure 6. Particulate emission density for the New Orleans study area, 1968.

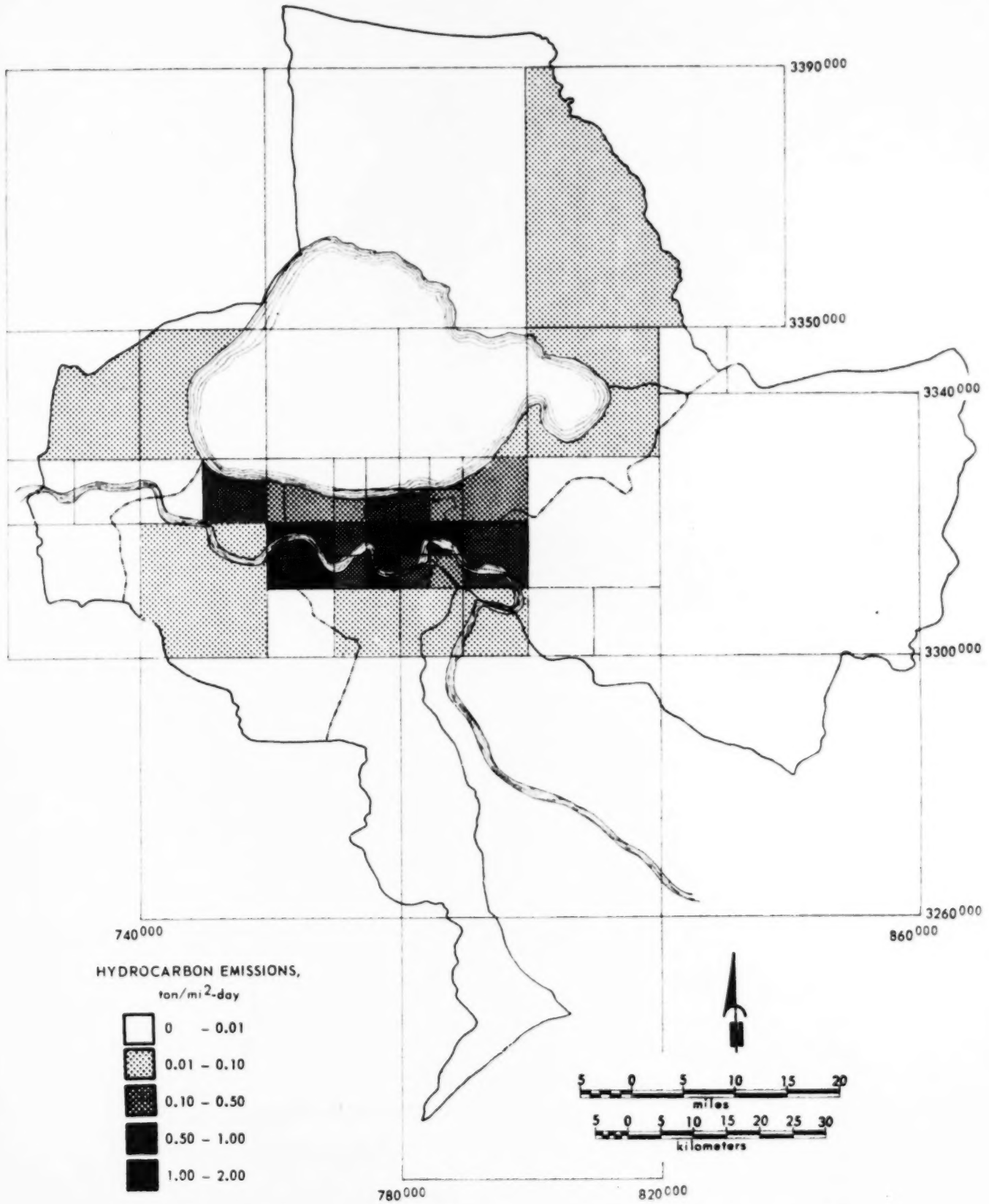

Figure 8. Hydrocarbon emission density for the New Orleans study area, 1968.

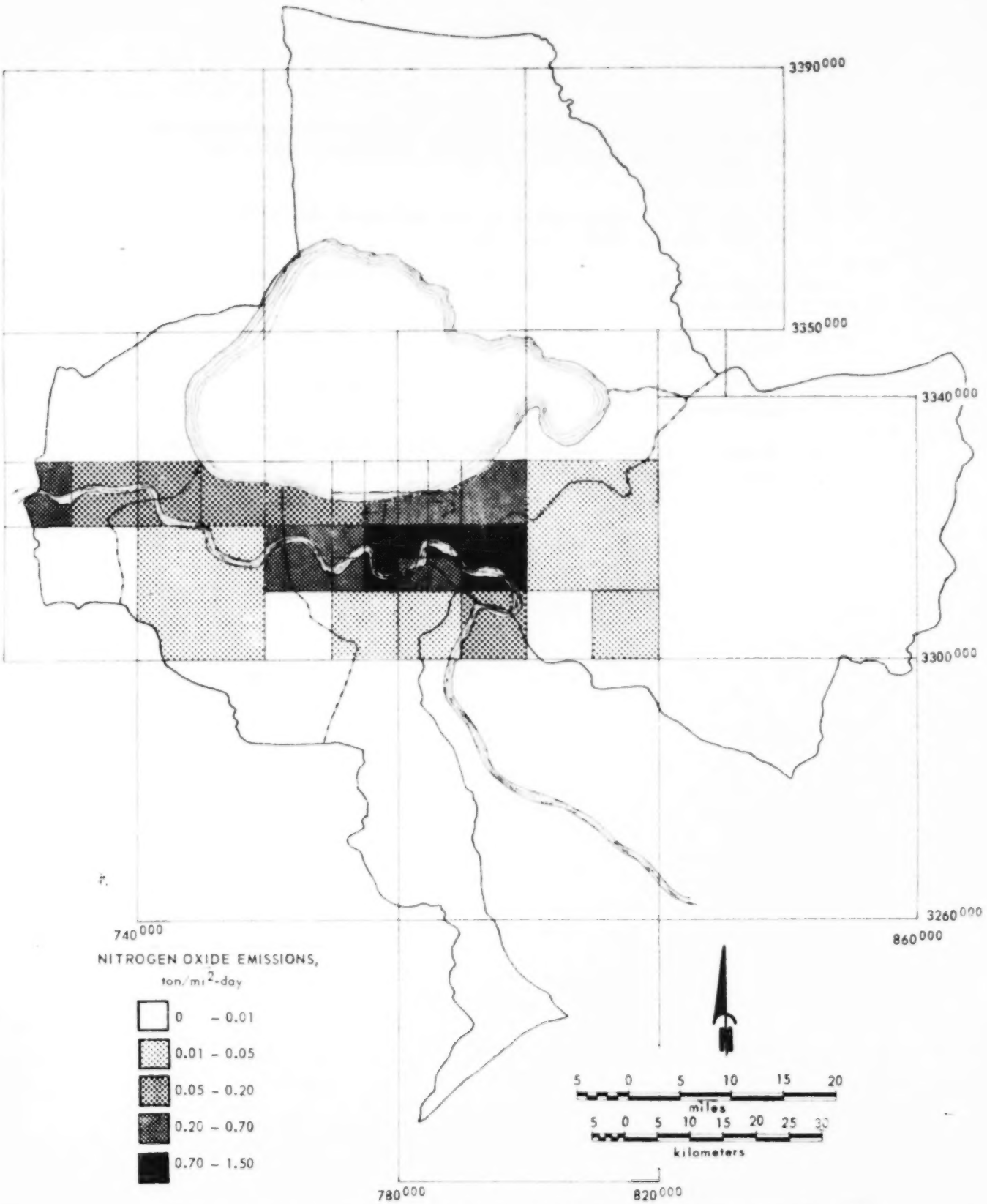

Figure 9. Nitrogen oxide emission density for the New Orleans study area, 1968.

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